

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Toshiharu Furukawa et al.	:	Date: January 29, 2004
Group Art Unit:	Unassigned	:	IBM Corporation
Examiner:	Unassigned	:	Intellectual Property Law
Serial No.:	Unassigned	:	Dept. 917, Bldg. 006-1
Filed:	Herewith	:	3605 Highway 52 North
Title:	VERTICAL NANOTUBE SEMICONDUCTOR DEVICE STRUCTURES AND METHODS OF FORMING THE SAME		Rochester, MN 55901-7829

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicants request that the information listed on the attached Form PTO/SB/08A be considered by the Office during the pendency of the above entitled application, pursuant to 37 C.F.R. §1.97. In accordance with 37 C.F.R. §1.97(h), the filing of this Information Disclosure Statement shall not constitute an admission that any information cited therein is, or is considered to be, material to patentability as defined in 37 C.F.R. §1.56(b). In the interest of full and complete disclosure to the Office, some or all of the art cited herein may not be considered by Applicant(s) or the Undersigned to be material under the new standard of materiality defined in 37 C.F.R. §1.56(b), enacted March 16, 1992, but may be material under the old standard of materiality defined in 37 C.F.R. §1.56(a), last amended on November 28, 1988, or may merely be technical background which may be of interest to the Examiner. In accordance with

Serial No. Unassigned  
Docket No. ROC920030268US1

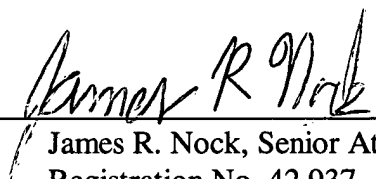
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37 C.F.R. §1.97(g), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made.

This Information Disclosure Statement is being filed under 37 C.F.R. §1.97(b)(1) within three months of the filing date of the present application. Accordingly no filing fee is required.

Date: January 29, 2004

Respectfully submitted,

By   
James R. Nock, Senior Attorney  
Registration No. 42,937

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PTO/SB/08A

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

Sheet 1 of 4

Application Number.: Unassigned  
 Filing Date: Herewith  
 First Named Inventor: Toshiharu Furukawa  
 Art Unit: Unassigned  
 Examiner Name: Unassigned  
 Attorney Docket Number.: ROC920030268US1

**U.S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	<u>Document Number</u> Number - Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns or Lines Where Relevant Passages or Figs. Appear
		US - 6,423,583 B1	07-23-2002	Avouris et al.	
		US - 6,515,325 B1	02-04-2003	Farnworth et al.	
		US - 2003/0168683 A1	09-11-2003	Farnworth et al.	
		US - 2003/0170930 A1	09-11-2003	Choi et al.	
		US - 2003/0178617 A1	09-25-2003	Appenzeller et al.	
		US -			
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**FOREIGN PATENT DOCUMENTS**

Examiner Initials	Cite No. <sup>1</sup>	<u>Foreign Patent Document</u> Country <sup>3</sup> - Number <sup>4</sup> - Kind Code <sup>5</sup> Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns or Lines Where Relevant Passages or Figs. Appear	T <sup>6</sup>

Examiner Signature		Date Considered	
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<sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kind Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3).

<sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language translation is attached.

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## OTHER PRIOR ART - NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and or country where published.	T <sup>2</sup>
		P. HARRIS, "Carbon Nanotubes and Related Structures," Cambridge University Press, 1999.	
		K. TEO et al., "Catalytic Synthesis of Carbon Nanotubes and Nanofibers," Encyclopedia of Nanoscience and Nanotechnology, Volume X, pp. 1-22, 2003.	
		Y. ZHAO et al., "Film Growth of Pillars of Multi-Walled Carbon Nanotubes," J. Phys.: Condens., Matter 15 (2003), L565-L569.	
		Y. ZHANG et al., "Electric-Field-Directed Growth of Aligned Single-Walled Carbon Nanotubes," Applied Physics Letters, Volume 79, Number 19, November 5, 2001.	
		"Synthesis of CNT's," <a href="http://nepp.nasa.gov/index_nasa.cfm/769/#synthesis">http://nepp.nasa.gov/index_nasa.cfm/769/#synthesis</a> .	
		C-H KIANG, "Growth of Large-Diameter Single-Walled Carbon Nanotubes," J. Phys. Chem. A 2000, 104, 2454-2456.	
		E. PLOENJES et al., "Single-Walled Nanotube Synthesis in CO Laser Pumped Carbon Monoxide Plasmas," Ohio State University, October 10, 2001.	
		E. PLOENJES et al., "Synthesis of Single-Walled Carbon Nanotubes in Vibrationally Non-Equilibrium Carbon Monoxide," Chemical Physics Letters 352 (2002), February 6, 2002, pp. 342-347.	
		Y. MO et al., "The Growth Mechanism of Carbon Nanotubes from Thermal Cracking of Acetylene Over Nickel Catalyst Supported on Alumina," Elsevier Science B.V., 2001.	
		M. JUNG et al., "Growth of Carbon Nanotubes by Chemical Vapor Deposition," Elsevier Science B.V., 2001.	
		H. W. ZHU et al., "Direct Synthesis of Long Single-Walled Carbon Nanotube Strands," Science, Vol. 296, May 3, 2002.	
		H. CUI et al., "Growth Behavior of Carbon Nanotubes on Multilayered Metal Catalyst Film in Chemical Vapor Deposition," Chemical Physics Letters 374 (2003), pp. 222-228.	
		J. LI et al., "Highly-Ordered Carbon Nanotube Arrays for Electronics Applications," Applied Physics Letters, Volume 75, Number 3, July 19, 1999, pp. 367-369.	
		P. COLLINS et al., "Engineering Carbon Nanotubes and Nanotube Circuits Using Electrical Breakdown," Science, Vol. 292, April 27, 2001, pp. 706-709.	

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		V. DERYCKE et al., "Carbon Nanotube Inter- and Intramolecular Logic Gates," Nano Letters, xxxx, Vol. 0, No. 0, A-D, received August 16, 2001.	
		P. COLLINS et al., "Nanotubes for Electronics," Scientific American, December 2000, pp. 62-69.	
		S. J. WIND et al., "Vertical Scaling of Carbon Nanotube Field-Effect Transistors Using Top Gate Electrodes," Applied Physics Letters, Volume 80, Number 20, May 20, 2002, pp. 3817-3819.	
		Z. F. REN et al., "Growth, Characterization, and Potential Applications of Periodic Carbon Nanotube Arrays," Department of Physics, Boston College, updated 2001.	
		J. LI et al., "Bottom-Up Approach for Carbon Nanotube Interconnects," NASA Ames Research Center, received December 5, 2002, accepted January 31, 2003.	
		A. CAO et al., "Grapevine-Like Growth of Single Walled Carbon Nanotubes Among Vertically Aligned Multiwalled Nanotube Arrays," Applied Physics Letters, Volume 79, Number 9, August 27, 2001, pp. 1252-1254.	
		"Carbon Nanotube Arrays: Synthesis of Dense Arrays of Well-Aligned Carbon Nanotubes Completely Filled with Titanium Carbide on Titanium Substrates," Battelle No. 12132.	
		A. CHANG, "Integration of Nanotubes into Devices," National Nanofabrication Users Network, Stanford Nanofabrication Facility, p. 58.	
		Z. HUANG et al., "Growth of Highly Oriented Carbon Nanotubes by Plasma-Enhanced Hot Filament Chemical Vapor Deposition," Applied Physics Letters, Volume 73, Number 26, December 28, 1998, pp. 3845-3847.	
		Z. REN et al., "Synthesis of Large Arrays of Well-Aligned Carbon Nanotubes on Glass," Science, Vol. 282, November 6, 1998, pp. 1105-1107.	
		Z. REN et al., "Large Arrays of Well-Aligned Carbon Nanotubes," Proceedings of 13th International Winter School on Electronic Properties of Novel Materials, pp. 263-267, February 27-March 6, 1999, Kirchberg / Tirol, Austria.	
		WON BONG CHOI et al., "Ultrahigh-Density Nanotransistors by Using Selectively Grown Vertical Carbon Nanotubes," Applied Physics Letters, Volume 79, Number 22, November 26, 2001, pp. 3696-3698.	

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		B. ZHENG et al., "Efficient CVD Growth of Single-Walled Carbon Nanotubes on Surfaces Using Carbon Monoxide Precursor," Nano Letters, xxxx, Vol. 0., No. 0, A-D, xxxx American Chemical Society, received June 4, 2002, revised June 26, 2002.	
		J. GORMAN, "Nanoscale Networks: Superlong Nanotubes Can Form a Grid," Science News Online, May 3, 2003, Vol. 163, No. 18.	
		"Tiny Nanotubes Set New Record," Nanotechweb.org, August 7, 2003.	
		"IBM Scientists Develop Carbon Nanotube Transistor Technology," IBM.com News, news report concerning work published in Science, Vol. 292, Issue 5517, April 27, 2001 entitled "Engineering Carbon Nanotubes and Nanotube Circuits Using Electrical Breakdown" by Phaeton Avouris et al.	

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